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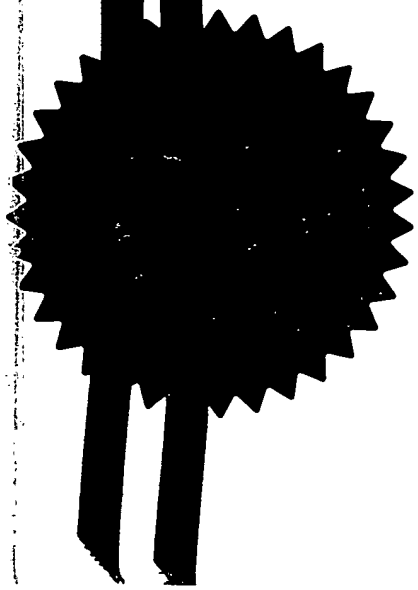

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Dated 26 JAN 1999

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1/77

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1. Your reference — 7603

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2. Patent application number *(The Patent Office will fill in this part)* — 29 APR 1998 — **9808997.2**

3. Full name, address and postcode of the or of each applicant *(underline all surnames)*

NCR INTERNATIONAL, INC.
1700 SOUTH PATTERSON BOULEVARD
DAYTON, OHIO 45479
UNITED STATES OF AMERICA

Patents ADP number *(if you know it)* 6105449001

If the applicant is a corporate body, give the country/state of its incorporation — INCORPORATED IN THE STATE OF DELAWARE

4. Title of the invention

BANKING AND RETAIL TRANSACTION TERMINAL AND NETWORK

5. Name of your agent *(if you have one)*

VIVIEN IRISH

"Address for service" in the United Kingdom to which all correspondence should be sent *(including the postcode)*

INTERNATIONAL IP DEPARTMENT
NCR LIMITED
206 MARYLEBONE ROAD
LONDON NW1 6LY

Patents ADP number *(if you know it)* 7186844001

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Country	Priority application number *(if you know it)*	Date of filing *(day / month / year)*

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application	Date of filing *(day / month / year)*

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? *(Answer 'Yes' if:*

a) any applicant named in part 3 is not an inventor, or
b) there is an inventor who is not named as an applicant, or
c) any named applicant is a corporate body.
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YES

Patents Form 1/77

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Continuation sheets of this form	
Description	11
Claim(s)	2
Abstract	1
Drawing(s)	12+28

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Statement of inventorship and right to grant of a patent *(Patents Form 7/77)*	
Request for preliminary examination and search *(Patents Form 9/77)*	
Request for substantive examination *(Patents Form 10/77)*	
Any other documents *(please specify)*	

11. I/We request the grant of a patent on the basis of this application.

Signature VIVIEN IRISH Date 27/04/98

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BANKING AND RETAIL TRANSACTION TERMINAL AND NETWORK

This invention relates to banking and retail transaction terminals and networks.

Typical banking and retail transaction terminals may comprise automated teller machines (ATMs), retail point-of-sale (PoS) terminals and general self-service terminals (SSTs). Each terminal has a central processor, typically PC based, which controls the application flow and user interface presentation. The application software and the graphics, animation and sound files used by the application are, typically, stored on a hard disk or other mass storage device within the terminal. The terminal is connected to a server through a connection, which may be either a high order communications link or a telephone based modem. The server contains an information database (termed a legacy Host). Numbers of terminals, which may be of the same or of a different kind, are connected to the server in a transaction network. Simple client-server transactions are conducted between the terminal and the server in order to obtain specific customer information used in the processing of the customer's transaction. In the case of an ATM the transaction may typically be a cash withdrawal or a balance request. In the case of a retail PoS terminal a typical transaction is a price lookup.

A transaction terminal includes peripheral devices that are often very specific to the function of the terminal. Typical peripheral devices included in an ATM are a card reader, a cash dispenser, a receipt printer and an encrypting keyboard. These devices are not normally found on a PC and must be added both physically and electrically and be provided with appropriate control software. The serial and parallel ports associated with a

PC can be used to supply control signals to the peripheral devices. Alternatively a proprietary communications system can be employed, for example the system known as Serial Distributed Control (SDC) is used in NCR ATMs. In either case the peripheral device requires some form of embedded processing capability to conduct communications with the central processor and to implement its commands upon the device.

All applications software, peripheral device drivers and user interface files are held in the mass storage device in the terminal. Typically these applications are large, monolithic systems with a central program being used to control all aspects of the operation of the terminal, from the user interface presented to the control of peripheral devices. This will also include the necessary business logic and error handling routines. In order to upgrade the software associated with any individual function or module it is necessary to install a new suite of application files onto the mass storage device. Particularly in the case of ATMs where security is a significant factor this can be an arduous task requiring secure disc build operations at each individual terminal.

While this may be feasible, although cumbersome, for the driver software in current use where changes are rarely required it is unlikely to be practical for transaction terminals in the future which will be required to function in a much more dynamic manner; for example with so-called "Smart" cards which have built-in electronic processing and data storage facilities. Card readers will need to be able to both read and write to different kinds of Smart cards and thus will need to be capable of dynamically changing their capabilities at run time. Smart card readers will be required to use different

drivers dependant on the actual Smart card that is inserted. Installing and maintaining various Smart card reader drivers within the main control application puts further strain on the system. There may also be a requirement to dynamically download new application software from the terminal to an inserted Smart card. Printers may require to dynamically download different graphics drivers to support various different graphics formats. Yet again dispensers may not be limited to dispensing cash only but may be required to dispense other media such that alternative or additional control software may be called for at run time.

While application development tools are becoming available that allow the developer to consider peripheral modules as functional components it is still, typically, necessary to provide business logic and error handling facilities for these components within a single central application.

It is an object of the invention to provide a transaction terminal or network in which the above problems are overcome.

According to the invention in one aspect a banking or retail transaction terminal includes a central processor which provides processing capabilities for a plurality of peripheral devices characterised in that each peripheral device has its own, independent, application running within the central processor. These applications are so constructed that they can communicate directly with each other. They can also communicate directly with an external server.

In an alternative embodiment a transaction terminal includes a plurality of peripheral devices having independent processing capabilities characterised in that communications links are provided from said devices to enable said devices to have individual access to an external server.

Preferably the communication links also enable such devices to communicate directly with each other.

The communication links may be dedicated links. Alternatively the communication links may comprise a modem and information signal transfer means for enabling transfer of signals from the modem through a telephone network to a server.

In carrying out the invention the peripheral devices may be selected from the following peripheral devices, namely: a user interface, a card reader, a receipt printer and a cash dispenser. The user interface may comprise a keyboard and a display unit.

According to the invention in another aspect a transaction network comprises a plurality of transaction terminals each including a plurality of peripheral devices, a central server, and communication links from the terminals to the server characterised in that the links extend to the server either from the central processor under the control of the peripheral modules control application or from each individual peripheral module within a terminal directly.

The network may include an information database (legacy Host) with a communications link extending between the information database and the central server.

In order that the invention may be more fully understood reference will now be made to the accompanying drawings in which:

Fig. 1 is a block diagrammatic representation of a transaction network embodying the invention and showing one terminal, and

Fig. 2 illustrates a software architectural view of the embodiment of Fig 1.

Fig. 3 is a block diagrammatic representation of an alternative transaction network embodying the invention and showing one terminal,

Fig. 4 is a flow chart of a typical sequence of events at an ATM terminal embodying the invention.

Referring to Fig. 1 there is shown therein a block diagram of a transaction network comprising an ATM 21 connected through a network connection 27 to a server 26. A transaction database (or legacy host) 28 is also connected to server 26 via a communications link 29. ATM 21 has a number of peripheral devices. These are a card reader 23, a receipt printer 24, and a cash dispenser 25. These devices are connected through suitable parallel or serial ports to a central processor 30 provided in ATM 21. ATM 21 also includes a keyboard 22 and a user display 31. A communications link 27 is provided from ATM 21 to server 26. Link 27 is typically a high order communications link to allow for efficient transfer of data from server 26 to ATM 21 although lower speed dial-up modems could be used if desired. When ATM 21 is turned on all application software is loaded from the mass storage device (not shown) associated with the central processor 30. Once operational the individual module applications running on central processor 30 use client-server techniques to

communicate with server 26 to obtain customer specific transactional information from legacy host 28.

An architectural view of the embodiment of Fig. 1 is illustrated in Fig. 2 in which like parts of Fig. 1 are similarly numbered. The application modules of Card reader 23, receipt printer 24 and cash dispenser 25, considered as software modules, control the operation of the associated peripheral modules through the corresponding device drivers 32. Similarly the User Interface application module 34 utilises a graphics display driver 33 to present appropriate information to the user. This application module will also use a keyboard (not shown) to gather user input.

An alternative hardware architecture capable of providing an embodiment of the invention is presented in Fig. 3, which shows an ATM 11 having a plurality of peripheral devices. In the example illustrated ATM 11 includes a user interface 12, a card reader 13, a receipt printer 14 and a cash dispenser 15. User interface 12 comprises both a keyboard and a display unit. A typical ATM keyboard will have a numeric keypad and a small number of additional keys, which may be labelled "ENTER", "CANCEL" and so on.

A server 16 is positioned at a suitable location externally of ATM 11. ATM 11 is connected to server 16 by a communication link 17, which can be of any of known type. For example link 17 may be part of a local area network (LAN), a wide area network (WAN) or else a dial up connection. Link 17 may be a high bandwidth network connection to allow for efficient and rapid download of software and may utilise the TCP/IP transfer protocol, although for single off-site terminals lower speed dial-up

modems can be used. Other transaction terminals, in addition to ATM 11 may be linked to server 16 through other communication links similar to link 17.

A feature of communication link 17 is that each peripheral device or module in ATM 11 is directly connected to server 16 through link 17 and is thus an individual client to server 16. Server 16 is connected to legacy Host 18 (which is the basic banking or retail information database) through a further information signal communication link 19. The applications software used by modules in ATM 11 is stored in server 16. The same applications software can also be used by corresponding modules in other terminals of the network which are linked to server 16.

The modules in terminal 11 can access link 17 using standard networking protocols such as TCP/IP in order to connect to server 16. Each module will contain an embedded processor and appropriate hardware control electronics in order to manipulate the hardware that constitutes the module. Within this embodiment of the invention the individual module applications run directly on the embedded processor.

In addition to link 17 providing a direct connection from each module to server 16, link 17 also enables communication to take place among the individual modules of ATM 11 themselves. Thus information as to the operational state of any of the modules can be broadcast to all the other modules.

The individual application modules that operate within either hardware embodiment of the invention (Fig. 1 or Fig. 3) are arranged to operate as a team, with each

application module being considered as a team member or peer. Each application module runs its own error handling, control and business logic based upon predetermined rules of operation. The applications are event driven with internal events, for example user input or hardware activity, driving the state of each application module. As the state of an application module changes it broadcasts appropriate messages to all the other members of the team. These event based messages are used to synchronise the different application modules to a common application state. As the state of any application module changes, due for example to hardware events, user input or time-out conditions, so an event message is broadcast to allow the other members of the team to act accordingly.

Initial "HELLO" messages are used to introduce each member of the current team configuration. This introductory process allows each team member to build a registry of the other application modules that are present and how to communicate with them. This team building process also allows user interface 12 to determine what peripheral devices are available and therefore what user services can be offered.

An application module that is closing down can send a "GOODBYE" message to indicate that it is no longer available. Peripheral modules can become non-functional. This can happen as a result of hardware failure (for example if a card is jammed in card reader 13) and an application module that has gone fatal would send a "GOODBYE" as it withdrew from the team. Alternatively if a peripheral module is physically removed, then the first application module that attempts to send a message to the now missing application module will detect that it is missing and send a "GOODBYE" message on its behalf. When

the peripheral module is reconnected its application module will broadcast a "HELLO" message to allow the other application modules to adapt accordingly.

The transaction terminal described herein operates as an event driven system. Messages are broadcast from application modules within which an event has occurred to other application modules within the terminal. These other application modules may, or may not, be concerned with that event. For ATM 11 and its user interface 12, card reader 13 and cash dispenser 15 a typical transaction sequence is illustrated in Fig. 4.

Referring now to Fig. 4 the first column shows a sequence of events and their associated event messages. The second, third and fourth columns show operations of user interface 12, card reader 13 and cash dispenser 14 following generation of each event message listed in the first column. In the second column, which shows the operation of user interface 12, the statements within quotation marks are examples of the text displayed on a screen to the user.

In the event of insertion of a card by a new user into card reader 13 a message "CARD_INSERTED" is broadcast by card reader 13. The effect of that message is to cause user interface 12 to display the text "Please enter PIN". When the user has entered a PIN number a 'Validate User PIN' operation takes place. This might involve the use of link 17 to communicate with legacy Host 18. If the entered PIN number is found to be valid for the particular card that has been inserted into card reader 13 then user interface 12 is informed accordingly whereupon it generates a "USER_VALID" event message. This causes display of a cash selection request. The user then enters

a specific amount which causes the broadcast of the next event message, namely "CASH_REQUEST".

The "CASH_REQUEST" message causes operation of cash dispenser 15 to count out the requested amount while at the same time user interface 12 causes the text "Your cash is being counted" to be displayed on the screen. When cash dispenser 15 has completed its task it generates a "CASH_STAGED" message which is used by card reader 13 to present the inserted card partly out of the card entry slot to enable it to be removed by the user. Card reader 13 then broadcasts the event message "CARD_PRESENTED" which in turn causes user interface 12 to display the text "Please take card".

When card reader 13 detects that the card has been taken it generates a "CARD_TAKEN" message. This message, on receipt by cash dispenser 15 causes it to present the cash that it has counted out. When that operation is done cash dispenser 15 generates a "CASH_PRESENTED" message to cause user interface 12 to display "Please take cash". On dispenser 15 detecting that the cash has been taken it broadcasts a "CASH_TAKEN" message to reset all the modules to their initial condition ready for another user.

From the above description it is apparent that the messages listed in the first column of Fig. 4 are used to drive individual application modules and thus the operation as a whole in the manner illustrated. Since the messages are broadcast they are available to all of the application modules. However in many cases only one application module or only some of the application modules will make use of the messages. For example card reader 13 may need to know the amount of any cash withdrawal figure entered by the user so that it can update the card

appropriately should that cash withdrawal be validated by server 16 and dispensed by cash dispenser 15.

Not shown in Fig. 4 are the various communications that take place between individual modules and server 16 and legacy Host 18. Since each application module has an independent connection through communication link 17 to server 16 it can communicate directly and independently with it. For example a request may be made for information specific to the user and appropriate to conduct the current transaction. Thus dispenser 15 will require the users current balance in order to determine if the user had sufficient funds to cover a requested cash withdrawal. User interface 12 may require account balance and bank statement information in order to present these to the user.

By having a direct connection from the peripheral devices to the server it is possible to allow the peripheral application modules to take a more active role in the overall operational flow and to conduct appropriate sections of the transaction business logic along with their own error handling. This allows the user interface application 12 to concentrate on its primary task of providing user interface display graphics, animation and video facilities. Within the hardware embodiment of the invention illustrated in Fig. 3 the processing power required to operate individual peripheral devices can then be selected to optimise the cost/performance ratio.

CLAIMS:

1. A banking or retail transaction terminal including a plurality of peripheral devices (12,13,14,15 or 22, 23, 24, 25, 34) characterised in that communication links (17 or 27) are provided from said devices to enable their control applications to have individual access to an external server.

2. The terminal as claimed in Claim 1 characterised in that inter process communications mechanisms or internal communication links (17) also enable such devices to communicate directly with each other.

3. The terminal as claimed in either one of the preceding claims in which a central processor (30) is included for providing processing power for peripheral devices (22, 23, 24, 25, 31).

4. The terminal as claimed in any one of the preceding claims characterised in that the peripheral devices are selected from the following peripheral devices, namely: a user interface (12), a card reader (13, 23), a receipt printer (14, 24) and a cash dispenser (15, 25).

5. The terminal as claimed in Claim 4 characterised in that the user interface comprises a keyboard (22) and a display unit (31).

6. The terminal as claimed in any one of the preceding claims in which the communication links (17 or 27) are dedicated links.

7. The terminal as claimed in any one of claims 1 to 4 in which the communication links (17 or 27) comprise a modem and information signal transfer means for enabling

transfer of signals from the modem through a telephone network to a server.

8. A banking or retail transaction network comprising a plurality of transaction terminals (11 or 21) as claimed in any one of the preceding claims together with a central server (16 or 26) to which each of the communication links (17 or 27) from the individual devices of the terminals are connected.

9. A banking or retail transaction network comprising a plurality of banking transaction terminals (11 or 21) each including a plurality of peripheral devices (12,13,14,15 or 22,23,24,25), a central server (16 or 26), and communication links (17 or 27) from the terminals (11 or 21) to the server (16 or 26) characterised in that the links (17 or 27) extend from each individual peripheral device (12,13,14,15 or 22,23,24,25), in a terminal (17 or 27) directly to the server (16 or 26).

10. The network as claimed in claim 8 or claim 9 in which there is provided a banking information database (18 or 28) and a communications link (19 or 29) between the banking information database (18 or 28) and the central server (16 or 26).

ABSTRACT

BANKING AND RETAIL TRANSACTION TERMINAL AND NETWORK

A banking or retail transaction terminal, for example an ATM (11), comprises a plurality of peripheral devices such as a user interface (12), card reader (13), receipt printer (14) and cash dispenser (15). A central server (16) is located externally of the terminal (11) and linked to the terminal (11) through a communications link (17). The link (17) also extends to the individual peripheral devices so that they are direct clients of the server (16). Additionally the individual peripheral devices are connected to each other over the link (17) to enable them to communicate directly with each other on a peer-to-peer basis. A banking information database (legacy Host) (18) is connected to the central server (16) through an information signal connection (19).

A banking or retail transaction network comprises a plurality of banking transaction terminals (11) each connected to a common central server (16) through communication links (17). (Fig. 1 or Fig. 3).

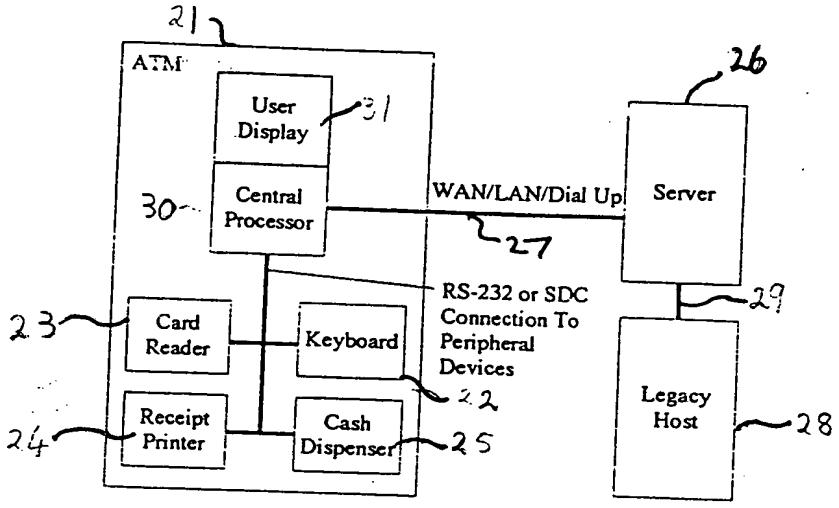
21
ATM
User Display
31
Central Processor
30
WAN/LAN/Dial Up
27
Server
26
RS-232 or SDC Connection To Peripheral Devices
29
23
Card Reader
Keyboard
22
Receipt Printer
24
Cash Dispenser
25
Legacy Host
28

FIG 1

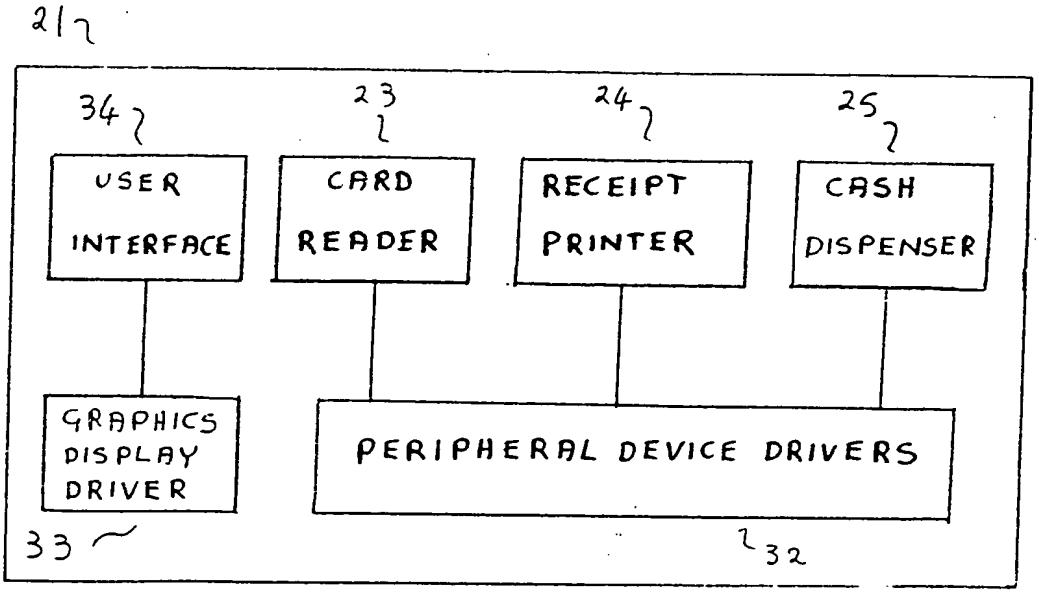
21
34
23
24
25
USER INTERFACE
CARD READER
RECEIPT PRINTER
CASH DISPENSER
GRAPHICS DISPLAY DRIVER
PERIPHERAL DEVICE DRIVERS
33
32

FIG 2

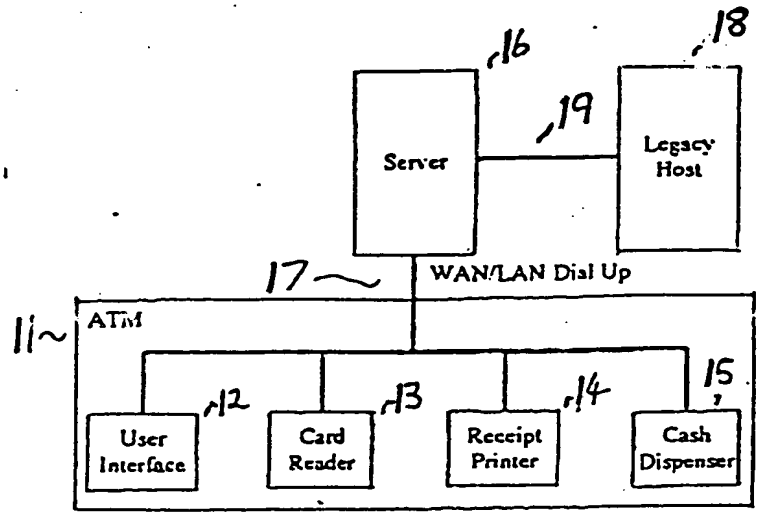
16
18
19
Server
Legacy Host
17
WAN/LAN Dial Up
11
ATM
12
13
14
15
User Interface
Card Reader
Receipt Printer
Cash Dispenser

FIG 3

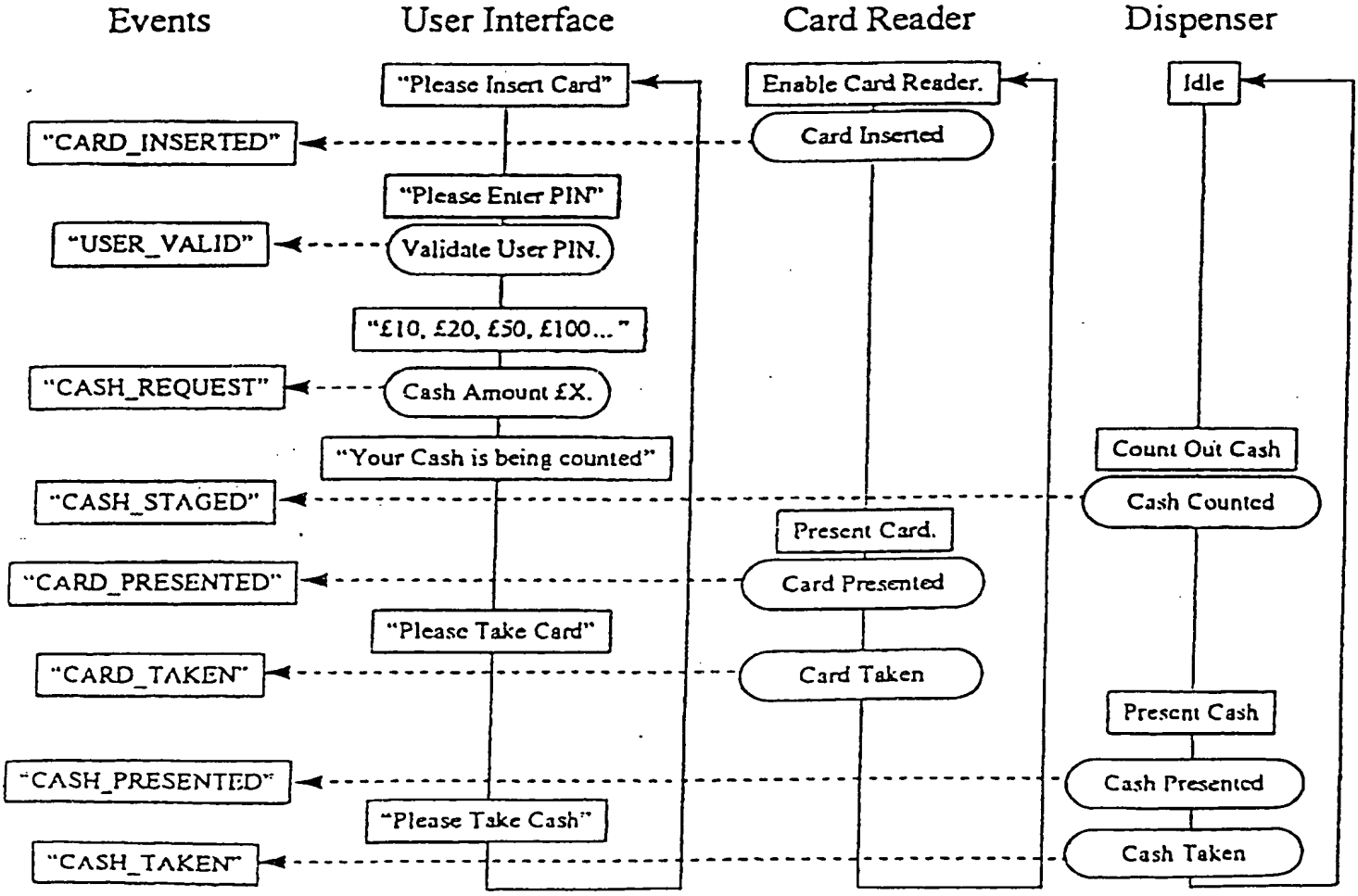
Events
User Interface
Card Reader
Dispenser
"Please Insert Card"
Enable Card Reader.
Idle
"CARD_INSERTED"
Card Inserted
"Please Enter PIN"
"USER_VALID"
Validate User PIN.
"£10, £20, £50, £100..."
"CASH_REQUEST"
Cash Amount £X.
"Your Cash is being counted"
Count Out Cash
"CASH_STAGED"
Cash Counted
Present Card.
"CARD_PRESENTED"
Card Presented
"Please Take Card"
"CARD_TAKEN"
Card Taken
Present Cash
"CASH_PRESENTED"
Cash Presented
"Please Take Cash"
"CASH_TAKEN"
Cash Taken

FIG 4